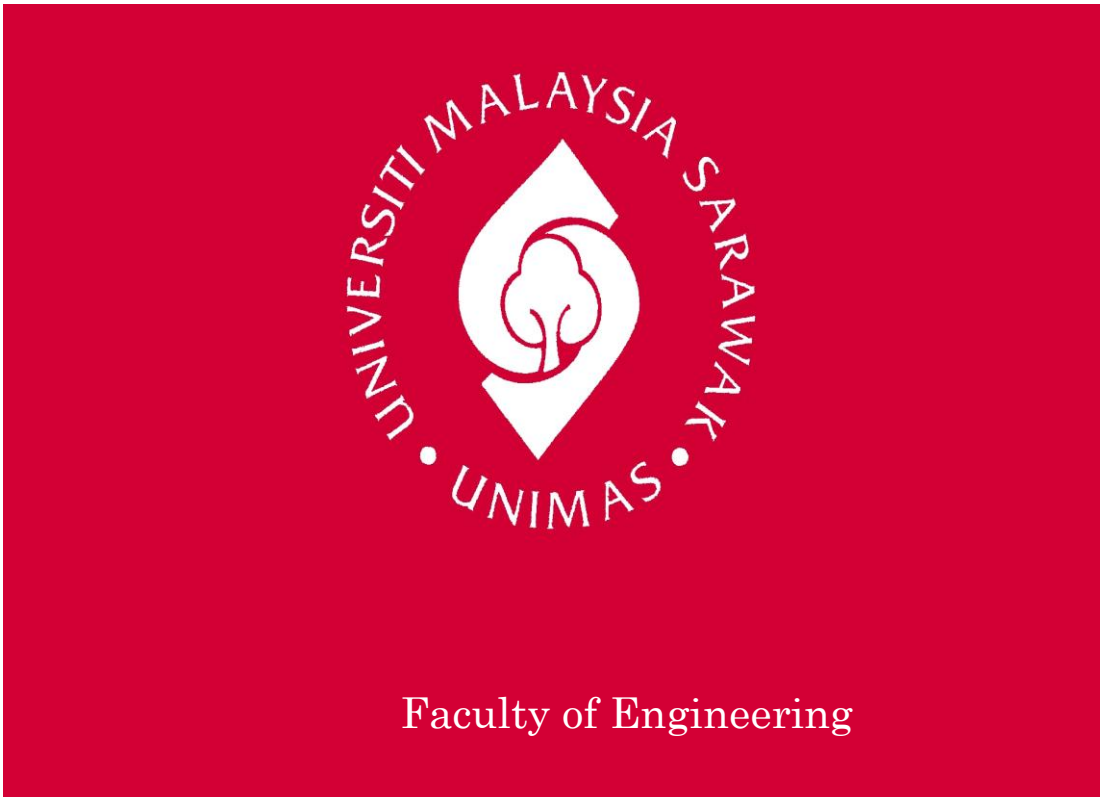

ANALYSIS OF CRITICAL FACTORS AFFECTING LEVEL OF SERVICE AT TRAFFIC LIGHT JUNCTION

FEDILIS ANN ANAK DIZER

Bachelor of Engineering with Honours
(Civil Engineering)
2010

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ANALYSIS OF CRITICAL FACTORS AFFECTING LEVEL OF SERVICE AT TRAFFIC LIGHT JUNCTION

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This thesis is submitted to Faculty of Engineering, Universiti Malaysia Sarawak in partial fulfillment of the requirement for the Degree of Bachelor of Engineering with Honours (Civil Engineering)

2010

To my beloved family

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ABSTRAK

Kajian ini adalah tentang faktor-faktor kritikal yang mempengaruhi tahap perkhidmatan di persimpangan lampu isyarat di negeri Sarawak, Malaysia. Dua persimpangan lampu isyarat yang dikaji adalah daripada dua bahagian di negeri Sarawak iaitu simpang bersignal Samarahan Expressway, Kota Samarahan dan simpang bersignal Jalan Stutong di bandar Kuching. Tiga faktor utama yang mempengaruhi tahap perkhidmatan sesebuah persimpangan termasuk keadaan geometri, keadaan lalu lintas dan kawalan keadaan setiap simpang yang dianalisis. Tiga faktor ini dianalisa untuk mendapatkan penyumbang utama terhadap peningkatan perkhidmatan kedua-dua simpang yang dipilih. Perisian SIDRA Intersection digunakan untuk menganalisa data yang diperolehi melalui kajian secara manual iaitu menganalisis bilangan kenderaan yang menggunakan persimpangan lampu isyarat di kedua-dua persimpangan bersignal yang dikaji pada tempoh puncak pagi. Kaedah analisis menggunakan dua atau tiga parameter dari tiga faktor-faktor utama. Dengan merujuk pada HCM, nilai-nilai pembolehubah bagi parameter tertentu dimasukkan ke perisian SIDRA Intersection untuk mendapatkan output, iaitu: purata perlengahan kawalan, tahap perkhidmatan yang sedia ada, dan kapasiti persimpangan. Nilai-nilai tetap yang dimasukkan ke perisian SIDRA Intersection diperolehi daripada kajian kelantangan lalu lintas. Input mempengaruhi nilai untuk purata perlengahan kawalan yang menentukan peringkat perkhidmatan persimpangan. Nilai-nilai output dipengaruhi oleh nilai-nilai parameter bagi setiap faktor yang input. Dari pemerhatian, kajian menunjukkan bahawa ketiga-tiga faktor merupakan faktor kritikal yang mempengaruhi tahap perkhidmatan kedua-dua simpang serta berkait antara satu sama

lain dan tidak ada yang melebihi faktor lain. Bagaimanapun, dari analisis, penyumbang utama terhadap peningkatan perkhidmatan persimpangan bersignal adalah jenis ketibaan dan kelebaran jalan.

ABSTRACT

This study is about the critical factors affecting the level of service at traffic light junction in Sarawak, Malaysia. Two junctions are selected from two divisions in Sarawak state which are Samarahan Expressway Traffic Light Junction, Kota Samarahan and Jalan Stutong Traffic Light Junction in Kuching city. The factors affecting the level of service are analysed under geometric condition, traffic condition and control condition for each of these intersections are analysed. In order to know which of these factors is the main contributor to Level of service of the two selected intersection, SIDRA Intersection software is used to analyse the data which are manually obtained through traffic volume study carried out at the two traffic light junction during the morning peak period. The method of analysis uses two or three parameters from different conditions. Whereas, by referring to the HCM, these variable parameter values are determined and then input into SIDRA Intersection to get the output, which was; average control delay, existing level of service, and capacity of junction. Fixed values to be input into SIDRA Intersection are obtained from the traffic volume study. The input influences the value for the average control delay which assists in determining the Level of service of the intersection. These output values are highly influenced by the parameters values of every factor that were input. From observations, all factors analysed under three conditions to determine level of service of the two traffic light junction were contributing equally and correlates with each other and there was not one that exceeds the other factor. Nevertheless from the analysis, the critical factor affecting the level of service is arrival type and lane width.

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LIST OF ABBREVIATIONS

LOS	- Level of Safety
MHCM	- Malaysian Highway Capacity Manual
HCM	- Highway Capacity Manual
MOE	- Measure of Effectiveness

CHAPTER 1

INTRODUCTION

1.1 Introduction

Malaysia, a multiracial country is becoming one of the fastest developing countries in South East Asia. In order to be well known in the eyes of the world, Malaysia has continuously increased the effort to develop and further improve to be the best, recognised, developed and modern country in the world. By developing the country, they have also developed a contemporary and more improved highway infrastructure to cater the needs of road users. Nevertheless, even having the best highway could not prevent traffic congestion.

Sarawak is one out of the thirteen states in Malaysia. Most of its road users suffer traffic congestion especially during peak hour. Due to the poor bus transport services, people are increasingly turning to private mode of transport, (Dr Amar Abg Johari Tun Openg, Housing and Development Minister Sarawak, the Star Newspaper, 2010). With more users opting for private transportation, the numbers of vehicles using the road will increase and eventually resulting in massive traffic congestion due to insufficient capacity of the existing roads in Sarawak.

Congestion has been a big problem in this country especially with the increase in traffic volume. Due to the traffic congestion, it has caused delays to road users to reach their destination. Traffic congestion is one of the many dilemmas drivers have to face being on the road. Congestion always happens especially during peak hour which is in the morning, afternoon and evening which is the time when road users goes to work and school and also comes back from work and school.

Traffic congestion has several adverse effects such as psychological and physiological effects for staying to long in their vehicles. Traffic increased anger and frustration for drivers and commuters experiencing delay thus resulting in tension and stress as they sit waiting in the traffic. This can even lead to increase accident rates. Another adverse effect of traffic congestion is on environment. As vehicle emission rises, air quality decreases. Noise level also increases. Both of these contribute to air pollution and noise pollution. In general, the city becomes a less pleasant place to live or work. Another major effect is on productivity and efficiency. There will be more wasted time. There will be delays at work, at school and even when doing errands resulting in reduced productivity. Workers and students are late for work or school. Salesmen and businessman waste hours in traffic jams, leading to lost of profits. Congestion also caused higher motoring fuel. Fuel will be wasted just sitting in the traffic. Other than congestion, our traffic light system does not function as effectively as it should since the configuration of the traffic light as well as the timing of the traffic light may not be suitable and different for various traffic light junctions.

Thus planning is important in order to reduce traffic congestion and accidents. With manuals for traffic analysis like Malaysian Highway Capacity Manual 2006 and